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ABSTRACT

Since migration is strongly influenced by economic variables, an economic model was developed to identify, locate, and track migrant and seasonal farmworkers as they move throughout the United States. Focusing on the Florida-based migrant agricultural workers who migrated at least once during the past five years, the model included the following independent variables that were correlated to the number of farmworkers who chose to migrate in a given year: distance; income; demand factors, i.e., amount of agricultural land, value of products, and unemployment rate; availability of Federal, state, and local programs; education; property ownership; and temperature. Each variable was evaluated in the base year for the states of Florida, Illinois, Indiana, Michigan, New York, North Carolina, Ohio, Texas, and Virginia. Data were obtained from various reports, a migrant farmworker questionnaire which collected basic information about the worker and his family, and a crew leader questionnaire which collected information on Florida-based crews and crew leaders and provided a basis for corroborating data collected on the farmworker questionnaire. A multivariate regression analysis was used on the data. Because of the type of data and the nature of the analyses, it was not expected that the equation would explain a large portion of the variation in the number of farmworkers migrating. As work on the model progresses, additional variables will be included in the regression equation to determine their contribution to the explanation of the migration decision. (NQ)

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D.A. LEWIS ASSOCIATES, INC.

A PREDICTIVE MODEL FOR MIGRANT FARMWORKER MOVEMENT IN THE UNITED STATES

Benjamin G. Davis
Director of Economic Studies
D. A. Lewis Associates, Inc.

Presented at the
November 1976 meeting
of the
Operations Research Society
of America

WASHINGTON DALLAS

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Preface

This paper has been prepared in an effort to make both research scientists and policy planners aware of migrant farmworkers and their problems. It was supported in part by grants from the Florida Department of Education and D. A. Lewis Associates, Inc.

Preparation of the paper would not have been possible without the sensitivity and assistance of a number of persons. Mr. Edward L. Klumpp of Kirschner Associates and Mr. Ami Glasberg of the World Bank provided technical input and guidance during the developmental stages of the study. Messrs. John Huss and David Lewis of D. A. Lewis Associates, Inc., reviewed the draft and made numerous suggestions as to changes that could be (and were) incorporated. Mrs. Barbara Busch and Mrs. Eileen Jeter most ably provided editorial and typing assistance in the final preparation of the paper. Without the active support and participation of each of these persons, the paper would not have been possible.

Introduction

It has become an almost standard introductory statement in any paper concerning migrant farmworkers to say something like, "On any scale of success, migrant farmworkers rank the lowest." This has been true in the past and it remains very true today. Migrant farmworkers performed an average of 78 days of farm wagework in 1974 and earned $1,688 ($21.60 per day). Migrant farmworkers are classified predominately as white, with nonwhites comprising 22 percent of the total group. When viewing this number, however, it must be remembered that some ethnic minorities, such as Mexican-Americans and native Americans (with their attendant language and cultural barriers) are not treated as separate groups but rather are grouped as whites. Coupled with the appallingly low income levels are relatively large family size and low educational levels. In the latter area, the number of years of schooling for migrant farmworkers is approximately six years less than that of the general population. Finally, knowledge of and access to public support programs that are available is severely limited.

Because of an increasing awareness of the problems that migrant and seasonal farmworkers face, education, labor, health, and welfare administrations have begun to reach out to these workers, but progress is slow. One of the major reasons why progress is slow is due to the great difficulty in identifying, locating, and tracking workers as they move throughout the United States. Until it is possible to quickly identify migrant

farmworkers and to anticipate and project their travel patterns, it will remain extremely difficult to provide the comprehensive package of social services that workers need.

Several previous efforts at tracking and predicting migrant farmworker flows have met with mixed success. Studies completed in the late 1950s and early 1960s by the U. S. Department of Labor form the basis for current thinking about movement patterns, studies which are now hopelessly outdated. The best source of current data is the Migrant Student Record Transfer System (MSRTS). This system was designed to transfer the academic and health records of migrant students from school district to school district as students and their families move about the United States. An adaption to this system developed by D. A. Lewis Associates, Inc., allows an evaluation of migrant student movements to be performed. MSRTS' strength (that it very effectively transfers records of migrant students who are enrolled in school programs) is its weakness for projection purposes. Since the system only contains records on school enrollments, not all workers (or their families) are included initially, and since not all states make a maximum effort to identify and recruit migrant students, the MSRTS cannot be used for projection purposes at this time.

This paper, therefore, will take a first step in identifying the determinants of migrant farmworker movement and, hence, understanding and predicting the travel patterns that workers follow.

Migrant Farmworker Characteristics

The migrant farmworker group comprises a significant segment of the total United States population. As can be seen in Figure 1, the number of migrant farmworkers was approximately

FIGURE 1

MIGRANT FARMWORKER POPULATION IN THE UNITED STATES[1]

Year	Number
1965	466,000
1971	172,000
1974	209,000

one-half million in 1965. This figure decreased steadily until 1971 when the trend was reversed and the number of active migrant farmworkers began to increase again to 209,000. While 209,000 may not appear to be a large number, when the number of dependents that travel in the stream is added to the number of workers, the total exceeds 1,000,000. The magnitude of this population may be seen by the fact that, based on the estimate of 2.7 children of school age per migrant worker, the number of children of migrant farmworkers who are or should be attending school exceeds the number of students enrolled in the school systems of 22 separate states. Given the number of persons who are directly involved in seasonal migrations, it is essential that more be known about their location and migration patterns.

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[1] Source, In-Season Farm Labor Reports, U. S. Department of Labor

The impact of the seasonality of migrant farmworkers employment and movement may be seen by looking at an individual state. Using the State of Florida as an example, migrant farmworker employment varies significantly month-by-month as may be seen in Figure 2. As a percent of the month of highest employment

FIGURE 2

MIGRANT FARMWORKER EMPLOYMENT IN FLORIDA
AS A PERCENT OF THE LARGEST MONTH - 1974

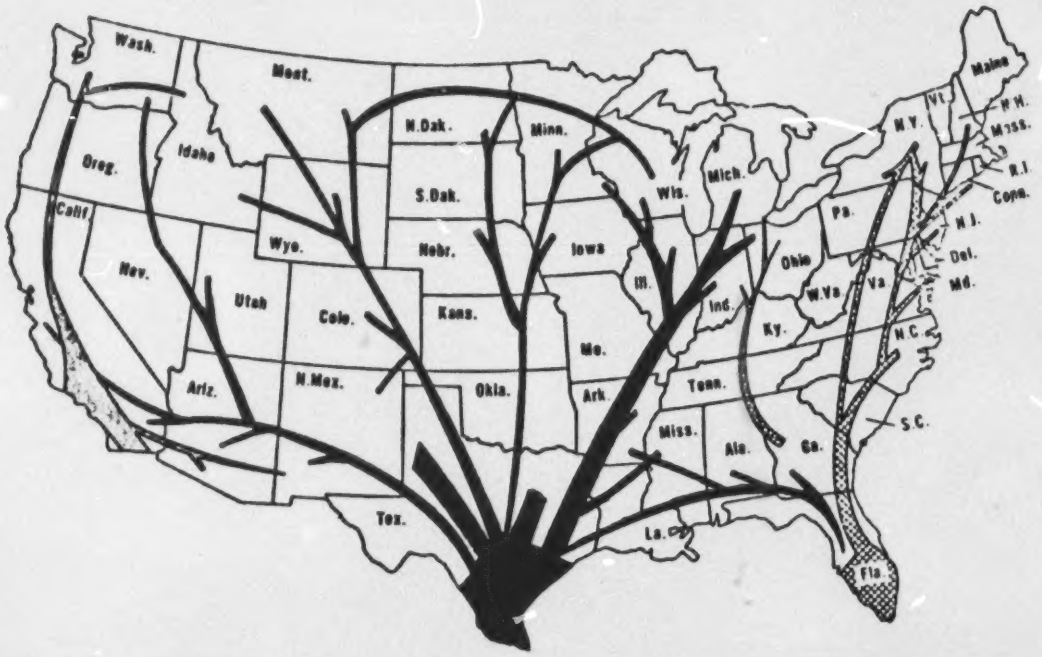
Month	Percent of Largest Month
January	98.3
February	92.4
March	100.0
April	99.2
May	98.3
June	24.6
July	14.4
August	3.4
September	5.1
October	21.2
November	41.5
December	56.8

(March), employment during August is only 3.4 percent of that total, a factor of 29. As Florida serves as a home base state, this variance may be seen in just the reverse in the states which the Florida-based migrant farmworker stream serves.

The term "stream" refers to the general path which migrant farmworkers follow as they move about the United States. There are three major streams as may be seen in Figure 3. One stream is based in California and works along the west coast of the United States. A second stream is based in Florida and serves the east coast and near mid-western states. The third stream is based in Texas and serves the broad mid-western area as well

FIGURE 3

MAJOR ROUTES FOLLOWED BY MIGRATORY FARMWORKERS*



*1966 Manpower Report, U. S. Department of Labor, p.129

as supplying workers who join both the Florida- and California-based streams. While general migration patterns have been known

for some time, little work has been done in identifying specific migratory routes or the reasons why these routes are followed by migrant farmworkers. This latter question will be addressed directly in this paper.

Model Selection

Population changes in any given area occur as a result of births, deaths, and in- and out-migration. The variables natality, mortality, and migration have long been recognized by demographers as the result of a rational decision process in which interacting economic, social, and demographic factors are taken into account.

The population in an area (whether a city, county, or state) may be defined by the following equation:

$$POP_{t+1} = POP_t + B_t + D_t + INM_t - OUTM_t$$

POP_t = Population at the beginning of period t

B_t = Births during time period t

D_t = Deaths during period t

INM_t = In-migration during period t

$OUTM_t$ = Out-migration during period t

Of the independent variables, POP_t is a stock variable while all the remaining independent variables are flow variables.

A number of economic theories has been put forward to explain variation in the birth and death rates. The major determinants, however, are ethnic, sociological, and other demographic factors which in the very short run do not impact on the migration decision. Migration, on the other hand, while affected by ethnic and sociological factors, is much more strongly influenced by economic variables, and thus an economic model has been developed.

The migration of the general population from rural to urban areas, from city to city, and internationally has been thoroughly reviewed in the economic literature. Studies on subsets of the population are rarer, and those on agricultural workers (with the exception of rural to urban migration) almost non-existent. Most of the studies that have been completed on the migration of persons from one location to another take the number of individuals migrating as the dependent variable and use a set of other variables such as distance, unemployment rate, wage rate, and others as independent variables. These variables, it is felt, act to explain the variation in migration. By and large these studies deal with general population movements. In this paper, the target population is migrant agricultural workers, specifically, agricultural workers who have migrated at least once during the past five years. This paper will also be limited to an evaluation of one of the three major migratory streams, the Florida-based stream.

The migration of Florida farmworkers takes two forms, intra-state which occurs between counties in Florida and interstate which occurs between Florida and states located mainly along two paths. One path goes through North Carolina, Virginia, Pennsylvania, New Jersey, New York, and another through Ohio, Michigan, Indiana, and Illinois. Texas draws migrants from Florida as well.

Since the target population is made up of agricultural workers, the problem has a time dimension. Not all types of crops in which the migrants work are harvested at the same time. The result is a "follow the crops" year-round cycle according to the seasons and the time crops mature. Thus, the month of migration is important for projection purposes because, as has been shown, there are large differences from one month to another in farmworker employment.

In evaluating the travel patterns of migrant farmworkers, there are two basic approaches that can be taken. The approaches are relatively similar in terms of the underlying concepts but are different in the types of data collected and in the way the approaches are implemented. These two basic approaches which were reviewed for adoption in this study are behavioral and economic approaches. The behavioral approach deals directly with the internal psychological and motivational factors that act upon a migrant worker. Models in the behavioral area that were reviewed for adoption in this study include psychological models and career choice models (modified

to meet the needs of the migrant farmworker population). These models seem to be more relevant to why an individual worker chooses to migrate rather than the place to which the worker will migrate given that he has decided to migrate. The economic approach, by way of contrast, is one which focuses on a single aspect of the migration decision and includes in its formulation factors which are basically external to the decisionmaker. These external factors include things such as wage rates, unemployment rates, and the demand for labor.

After reviewing the approaches that could be used to address the migrant farmworker movement question, it was decided to utilize the economic approach. It was determined that the validity of this model is significantly greater than that of the behavioral model, especially as it is applied to this population. The economic approach has been utilized much more frequently in the evaluation of migration, and, while data are limited in this area, they are in significantly greater supply than those for the behavioral approach. There is no need for the two approaches to operate in isolation, however, and it is anticipated that as further studies are undertaken, the more specifically behavioral aspects will be included more directly into the overall approach.

The economic model which has been selected for use in this study is one that is fairly common to migration research but one which has not been applied to a population of this nature. In

collecting data and in evaluating the results, two separate approaches can be taken. Migration from one location to another may occur because of either push or pull phenomena. The idea that migration is a result of a push phenomenon centers on the concept that migration is a result of conditions that exist in the home state or location which caused the migrant to choose to move. Among the factors that might be included here are things such as the local unemployment rate, climatological conditions, local wage rates, etc.

On the other hand, the pull approach to migration is centered on the idea that it is factors in the areas to which individuals move that cause migration. In other words, workers are drawn or pulled from their home state to their new location. Among the pull factors that are of particular relevance for migrant agricultural population are the size of the harvest in other states, local unemployment rates in those states, and relative wage rates.

Both of the approaches to the migration decision as it is faced by the migrant agricultural worker were reviewed. The weight of facts indicated that it was pull factors which were more relevant. On reviewing the data that were available and the previous studies done on migration, it was determined that the migrant farmworker population responded to opportunities provided in other states and that it was this set of opportunities that acted as the driving force, pulling workers from the

home base state to the other states. One factor which has influenced the selection of the pull approach was that a relatively high proportion of migrants appear to own property, especially homes, within the home base states and yet choose to migrate even during years when employment opportunities are relatively great within the state.

The economic model which has been utilized in this study includes a relatively small number of independent variables that have been correlated to the number of farmworkers who choose to migrate in a given year. Each of the basic variables has been evaluated in the base year for nine key states. These states include Florida (the home-base state for a significant number of migrant farmworkers) and the eight states which continuously draw the largest proportion of Florida's migrant labor population. These eight states are: Illinois, Indiana, Michigan, New York, North Carolina, Ohio, Texas, and Virginia.

Variables Included in the Model

The identification of the explanatory variables which should be included and what the expected influence of each is on the migration process are key questions. From the many plausible variables which might explain migration, there are a few which have been found to be of great importance. The following will not be a complete enumeration of all possible variables. Rather, the analysis will concentrate on several variables which seem *a priori* to account for most of the variation in the dependent variable. Hence, the dependent variable is gross

out-migration and not net migration as is at times used in studies of migration, so the value of variables at seperate locations should be used and not the difference between the value of the variables at the receiving and sending locations.

In other migration studies, variables such as distance, incomes, wage rates, unemployment rates, and others are used. These are usually demand variables, supply indicators, and other social and demographic variables which the researcher finds approproate to include in his study. In this particular case, the target population is well defined and has special characteristics, and migration is mainly an economic problem — the need for a job and income is the main factor behind migration.

The following is a description of each variable and its expected effect on migration.

1. Distance — The greater the distance to the place of employment, the less people are willing to migrate. This variable represents several factors. The first is the full costs involved in travelling. Second is the time lost in travelling while work could have been done. Third is what is referred to as "psychic costs" in terms of leaving relatives and familiar surroundings behind. Finally, distance represents information costs. The information about availability of jobs is (expected to be) easier to obtain from the next county than from a distant state.

2. Wage Rate (income) — The higher the wage rate offered in a particular location and the greater number of days promised, the more migration will tend to flow toward this location. Income is a better form of the variable than the wage rate because it takes into account the number of hours worked (when income data are available).

3. Demand Factors — Several approaches may be taken to the estimation of demand. One is the amount of agricultural land in a location on which particular crops known to require migrant labor services are grown. Alternatively, total agricultural production of these crops is an indicator of demand for labor services. Similarly, the value of these products can be used. These variables might be found to be more influential with a lag in that migrants may have learned that there was a demand for their services in a given location in the preceding year and tend to go to that location in the current year. The unemployment rate at each location is a measure of the competition the migrants face in supplying labor services, so its effect should be negative. Another alternative is to utilize the rate of change of these variables rather than their current or lagged levels. A state with a fast growing agricultural industry will have a greater tendency to attract migrants.

4. Federal, State, and Local Programs — The availability of social assistance programs may tend to attract migrants, especially those with larger families.

5. Education — The more highly educated migrant will find other jobs more easily and thus may tend to enter the settling-out process.

6. Property Ownership — Ownership of property, especially houses, may be expected to have the effect of inhibiting migration.

7. Temperature — Since most agricultural work is done during particular seasons, the weather has an effect on the yield and thus on the demand for labor. Temperature (or variation of the mean monthly temperature from the 30-year average) may be utilized as a proxy for weather.

Data Sources

In describing the migrant population in Florida for this study, three basic sources were relied upon. The first source was the Kleinert Report. This report entitled, Migrant Children in Florida 1968-1969, presented the most complete set of data on Florida migrant families that was available. Although dated now, the study still remains a landmark in the area of migrant education and migrant population description. The second data source which was utilized was a series of reports produced by the Economic Research Service of the U. S. Department of Agriculture. The third data source was a series of questionnaires which were designed specifically for this study to collect up-to-date information on the migrant farmworker population in Florida. Two of the questionnaires developed were:

1. Migrant Farmworker Questionnaire — The migrant farmworker questionnaire was designed to collect basic information about the worker and his family. Types of information collected by this instrument were the sex, age, last grade completed in school, age at leaving school, age started working, and number of years traveling in the migrant stream for each member of the family. In addition to this basic demographic data, some information was collected on worker likes and dislikes, worker travel patterns, and migrant family needs. The information for this questionnaire was collected by direct interview with a sample of 287 migrants in 5 different counties in Florida. Workers were interviewed at selected camps and work sites by a small number of former migrants who were trained in the needs of the study and basic interviewing techniques. The result of this questionnaire is a package of the most recent information on farmworker demographics, travel patterns, and aspirations available.

2. Crew Leader Questionnaire — A crew leader questionnaire was developed in an attempt to accomplish two basic things — (a) to directly collect information on Florida-based crews and crew leaders and (b) to provide a basis for corroborating data collected on the migrant farmworker questionnaire. The types of data collected on the crew leader questionnaire include some basic

background information about the crew leader, a description of crew characteristics at the time of crew formation in 1975, and a description of crew travel patterns during the year. The data on this crew leader questionnaire were collected by direct interview with a sample of 32 crew leaders in 4 Florida counties. Again, these interviews were conducted by former migrant farmworkers who were of the same racial or ethnic background as the crew leaders they interviewed and who were intimately familiar with both working conditions and crew functioning.

Mathematical Approach and Results

The specific mathematical approach which has been utilized in this portion of the study is multivariate regression analysis. The regression equation took the form as follows:

$$M = f(P, W, D, U, etc.)$$

where: M = Number of farmworkers migrating

P = Demand for labor based on crop harvests

W = Agricultural wage rates (without room and board)

D = Distance between agricultural centers

U = Unemployment rates

Because of the type of data that were available and the nature of the analyses that were being performed, it was not expected that the equation would explain a large portion of the variation in the number of farmworkers migrating, the expectation being that the R^2 for this equation would be relatively low. The result obtained from exercising the model was

a coefficient of determination (R^2) that was much higher than had been anticipated, i.e., that the basic variables included in the multivariate regression analysis explained a significant portion of the variation in the number of farmworkers migrating in a given year to a given state. As a result of this work, the multivariate regression approach appears to be quite satisfactory. As work on this model progresses, additional variables will be included in the regression equation to determine their contribution to the explanation of the migration decision. Included among the variables that will be added to the model are: technological change (application of machinery to planting and harvesting), unionization activities, levels of public assistance in various states, home ownership, etc.

In attempting to find a regression equation that would fit both the 1968 and 1974 observations, a large number of different equation forms was tried. Data were analyzed using a standard multivariate regression technique for each year separately and using the pooled cross-section time series approach for both years combined. In all, a total of approximately 100 different regressions was tried, each with a different set of variables. The data and data sources that were utilized may be seen in Appendices 1 through 4. The equations were run in both linear and double-log form. As a result of these experiments, one equation stood out as most successful in explaining the migration of Florida migrant families to other states. This equation

is of the following multiplicative form:

$$M = C\ (D^a)\ (GP^b)\ (W^d)$$

where M = Percent of Florida-based farmworkers migrating to state i

C = A constant

D = Distance between agricultural centers

GP = Growth rate in agricultural production

W = Agricultural wage rate

Taking natural logarithms and adding a stochastic error term yields:

$$\ln M = C + a(\ln D) + b\ (\ln GP) + d(\ln W) = v$$

Where: C = lnC and v is an error term

For 1968, the estimated regression was:

$$\ln M = \underset{(1.44)}{2.41} - \underset{(0.26)}{0.29}\ \ln D + \underset{(0.14)}{0.12}\ \ln GP + \underset{(1.99)}{3.42}\ \ln W$$

Since the equation is in double-log form, the coefficients are elasticities. The figures in parentheses are the standard deviations of the coefficients.

For 1974, the estimated regression was:

$$\ln M = \underset{(17.41)}{-34.34} - \underset{(0.04)}{0.04}\ \ln D + \underset{(0.11)}{0.23}\ \ln GP + \underset{(9.26)}{23.72}\ \ln W$$

The coefficients of multiple determination are:

$$R^2(1968) = .34$$

$$R^2(1974) = .68$$

The R^2 shown is an indication of the explanatory power of the regression equation. The R^2s shown are both relatively

high in comparison with other migration studies. It is believed that the increase in R^2 between 1968 and 1974 data is valid and significant. This belief is based on the interviews conducted with individuals in the field concerning their reasons for traveling to various states. It was found in those discussions that economic variables are increasingly important, especially given the high rate of inflation in general goods and services and in the significant increase in the cost of fuel which impacts particularly heavily on the migrant worker. As may be seen by comparing the coefficients, the wage rate is the most powerful explanatory variable. This finding has been true in almost every set of data that has been evaluated concerning the migrant farmworker, with all other variables of lesser significance.

Conclusion

For the general population, a multitude of social services is available, generally within a short distance of the individual's residence. Education, health, welfare, and most other social services are provided by states and municipalities and their location is well known by residents. Unfortunately, this is not the case for migrant farmworkers. Due to their mobility, migrant farmworkers rarely learn of or live close enough to social service systems to participate at the same rate as the general population. This is the primary reason for the study.

The second major reason for this study was to dispel some false ideas concerning the migrant farmworker population.

Migrant farmworkers are often considered to be somewhat irrational in terms of their responses and analytic thought processes. Few social scientists view migrant farmworkers as skilled, rational economists who react quite intelligently and predictably to the signals sent out by the national economy. Knowing that they, in fact, do react rationally, it is now possible to predict migrant farmworker movements and is possible to have the necessary social service systems in place and ready to meet the specific needs of the individuals. What must be done is to determine the size of the total migrant farmworker population within the stream and then to project (giving proper consideration to climatological factors) the change in agricultural output and wage rates in the states under consideration. Once this type of analysis is completed, migrant farmworker movements can be predicted with a relatively high degree of accuracy and this underserved segment of the population can be brought more into the main stream of the American social service system.

APPENDICES

APPENDIX 1

DATA USED IN REGRESSION EQUATIONS - 1968

DEFINITIONS AND SOURCES

M = Percent of Florida-based migrant workers in state i in August.
Source: Migrant Children in Florida (1968-9) (Kleinert Report), p.99

D = Distance between agricultural centers in Florida and state i in miles. Distance to Florida agricultural centers assumed to be 50 miles.
Source: Rand-McNally Atlas

UR = Unemployment rate in state i in percent of total labor force.
Source: USDoL area data

EM_i = Peak monthly employment of migratory agricultural workers in state i.
Source: In-Season Farm Labor Report (ES-223), Manpower Administration USDoL

E_i^{Aug} = Employment of migratory agricultural workers in state i in August.
Source: In-Season Farm Labor Report (ES-223), Manpower Administration USDoL

E_i^* = Average employment of migratory agricultural workers in state i in June, July, and August.
Source: In-Season Farm Labor Report (ES-223), Manpower Administration USDol

GP_i = Growth rate in agricultural production in state i (1966 to 1967)
Source: Citrus Fruits, Noncitrus Fruits and Nuts, and Vegetables - Fresh Market, all by SRS, USDA

AP_i = Agricultural production in state i in selected (migrant related) crops.
Source: Citrus Fruits, Noncitrus Fruits and Nuts, and Vegetables - Fresh Market, all by SRS, USDA

L_i = Land in farms in state i in million acres.
Source: 1969 Census of Agriculture, Table 1

W_i = Agricultural wage rate without board and room in state i in dollars per hour.
Source: Farm Labor Report, SRS, USDA

APPENDIX 2

1968 DATA USED IN REGRESSION EQUATIONS

State	M.	D.	UR	EM_i	$E_i^{Aug.}$	E_i^*	GP_i	AP_i	L_i	W_i
Florida	10	50	2.8	21.5	.5	1.07	-23.9	178636	14.0	1.30
Indiana	3	822	3.2	9.0	5.0	5.63	12.0	2012	17.6	1.49
Michigan	9	1101	4.3	40.0	40.0	26.97	-14.8	10185	11.9	1.50
New Jersey	10	921	4.6	12.1	12.1	10.77	14.3	4371	1.0	1.60
New York	18	1067	3.5	14.8	9.3	10.37	9.1	14125	10.1	1.54
North Carolina	3	492	3.2	8.7	8.3	7.23	8.8	4262	31.2	1.16
Ohio	6	854	2.9	18.5	13.6	13.2	21.7	2800	17.1	1.39
Pennsylvania	3	855	3.2	5.9	3.6	3.73	.3	5892	8.9	1.42
Texas	5	911	2.7	19.8	14.7	13.63	9.9	18475	142.5	1.23
Virginia	6	645	2.7	4.5	3.3	3.5	50.8	5354	25.4	1.17
MEAN	7.3	771.8	3.31	15.48	11.04	9.61	8.82	24611.2	27.92	1.38
STANDARD DEVIATION	4.67	294.7	.624	9.89	10.64	7.06	20.20	54376.1	38.87	.149

APPENDIX 3

DATA USED IN REGRESSION EQUATIONS - 1974

DEFINITIONS AND SOURCES

M = Percent of Florida-based migrant workers in state i in August.
Source: Worker and Crew Leader data collected by D. A. Lewis Associates

D = Distance between agricultural centers in Florida and state i in miles. Distance to Florida agricultural centers assumed to be 50 miles.
Source: Rand-McNally Atlas

UR = Unemployment rate in state i in percent of total labor force.
Source: USDoL area data

EM_i = Peak monthly employment of migratory agricultural workers in state i.
Source: In-Season Farm Labor Report (ES-223), Manpower Administration USDoL

E_i^{Aug} = Employment of migratory agricultural workers in state i in August.
Source: In-Season Farm Labor Report (ES-223), Manpower Administration USDoL

E_i^* = Average employment of migratory agricultural workers in state i in June, July, and August.
Source: In-Season Farm Labor Report (ES-223), Manpower Administration USDoL

GP_i = Growth rate in agricultural production in state i (1972 to 1973).
Source: Citrus Fruits, Noncitrus Fruits and Nuts, and Vegetables - Fresh Market, all by SRS, USDA

AP_i = Agricultural production in state i in selected (migrant related) crops.
Source: Citrus Fruits, Noncitrus Fruits and Nuts, and Vegetables - Fresh Market, all by SRS, USDA

W_i = Agricultural wage rate without board and room in state i in dollars per hour.
Source: Farm Labor Report, SRS, USDA

APPENDIX 4

1974 DATA USED IN REGRESSION EQUATIONS

State	M.	D.	UR	EM_i	E_i^{Aug}	E_i^*	GP_i	AP_i	W_i
Florida	10.8	50	6.2	11.8	.4	1.7	0.1	218692	1.98
Indiana	16.9	822	5.2	4.9	2.5	1.7	1.8	2419	2.20
Michigan	9.3	1101	8.5	11.4	11.4	10.3	-31.3	11589	2.31
New York	13.1	1067	6.4	7.7	4.9	3.2	2.2	13967	2.20
North Carolina	8.9	492	4.5	10.4	10.0	7.5	- 3.9	4608	1.89
Ohio	6.9	854	4.8	10.3	8.8	5.4	-14.6	2812	2.13
Texas	4.1	911	4.3	10.2	7.2	6.9	- 4.3	18792	1.95
Virginia	9.9	645	4.6	3.0	2.7	2.1	- 4.5	4909	1.90

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